

FIG. 1 (PRIOR ART)

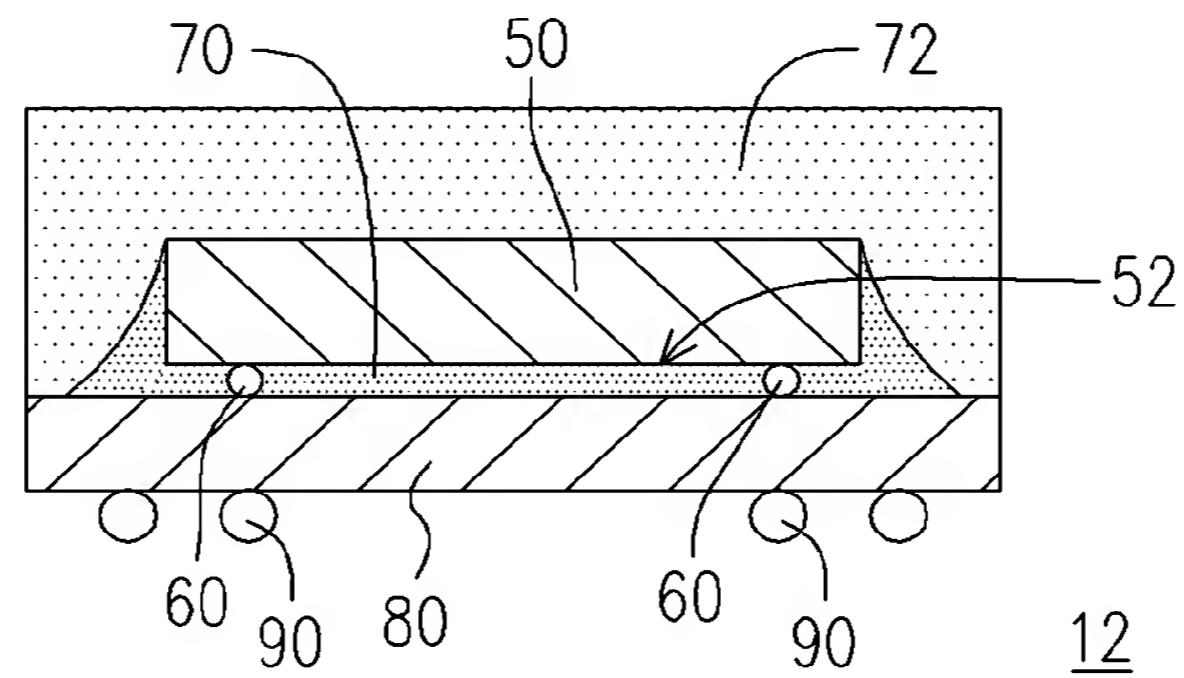


FIG. 2A (PRIOR ART)

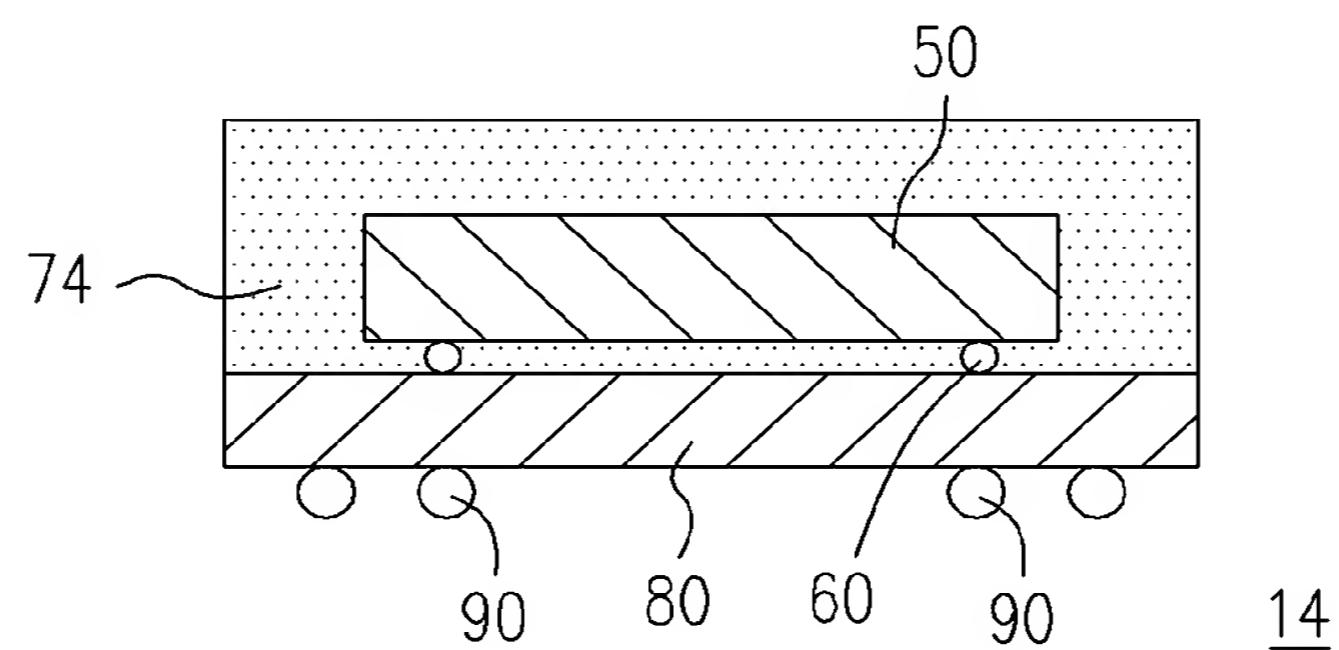


FIG. 2B (PRIOR ART)

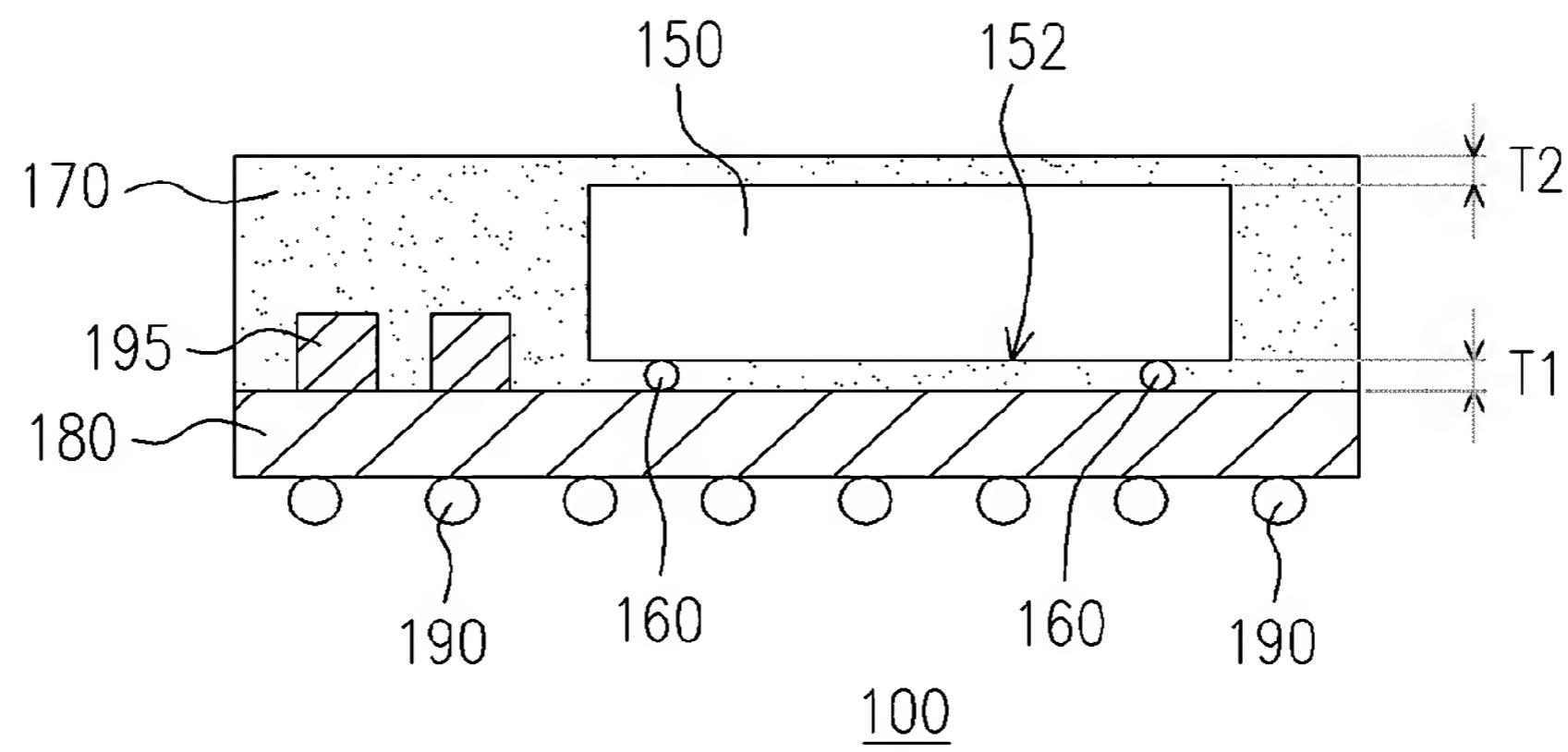


FIG. 3

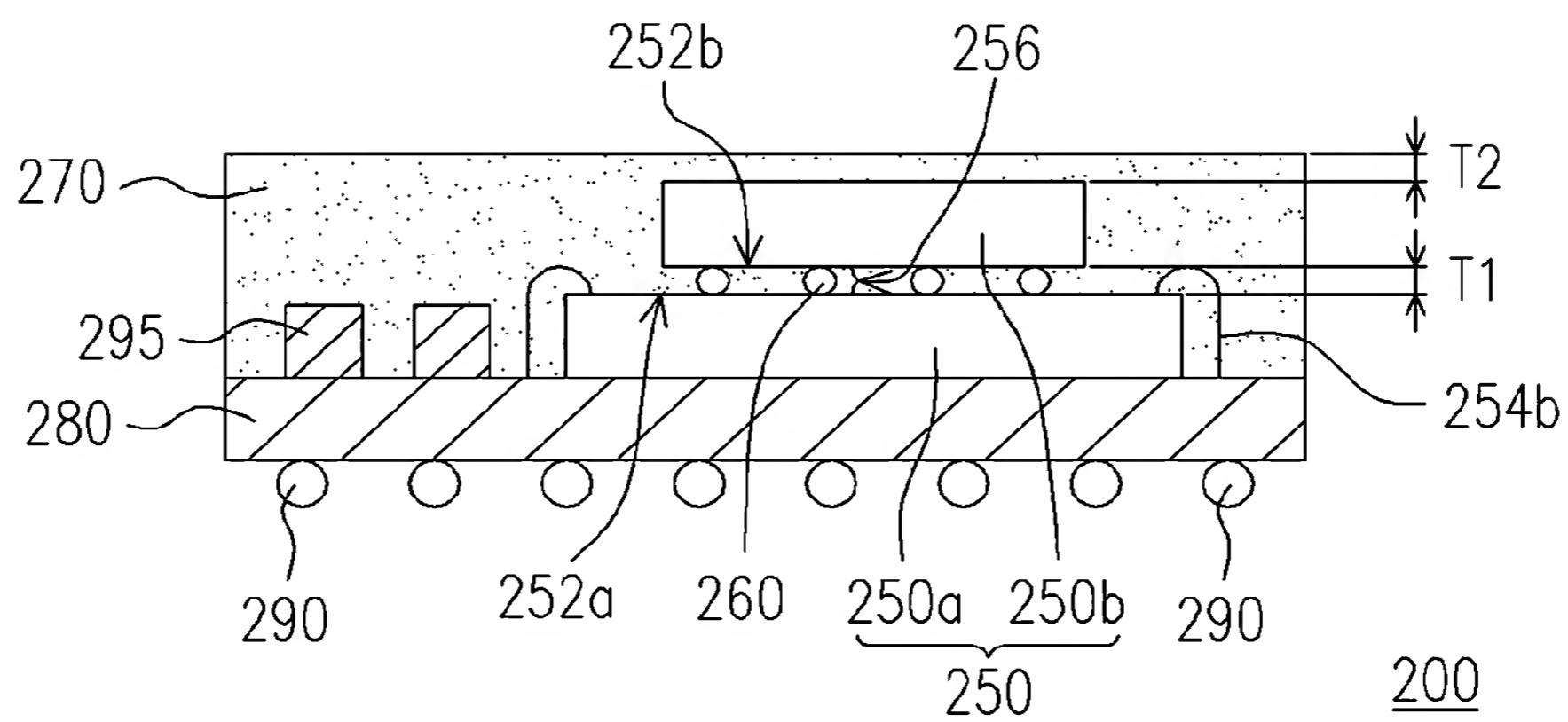


FIG. 4

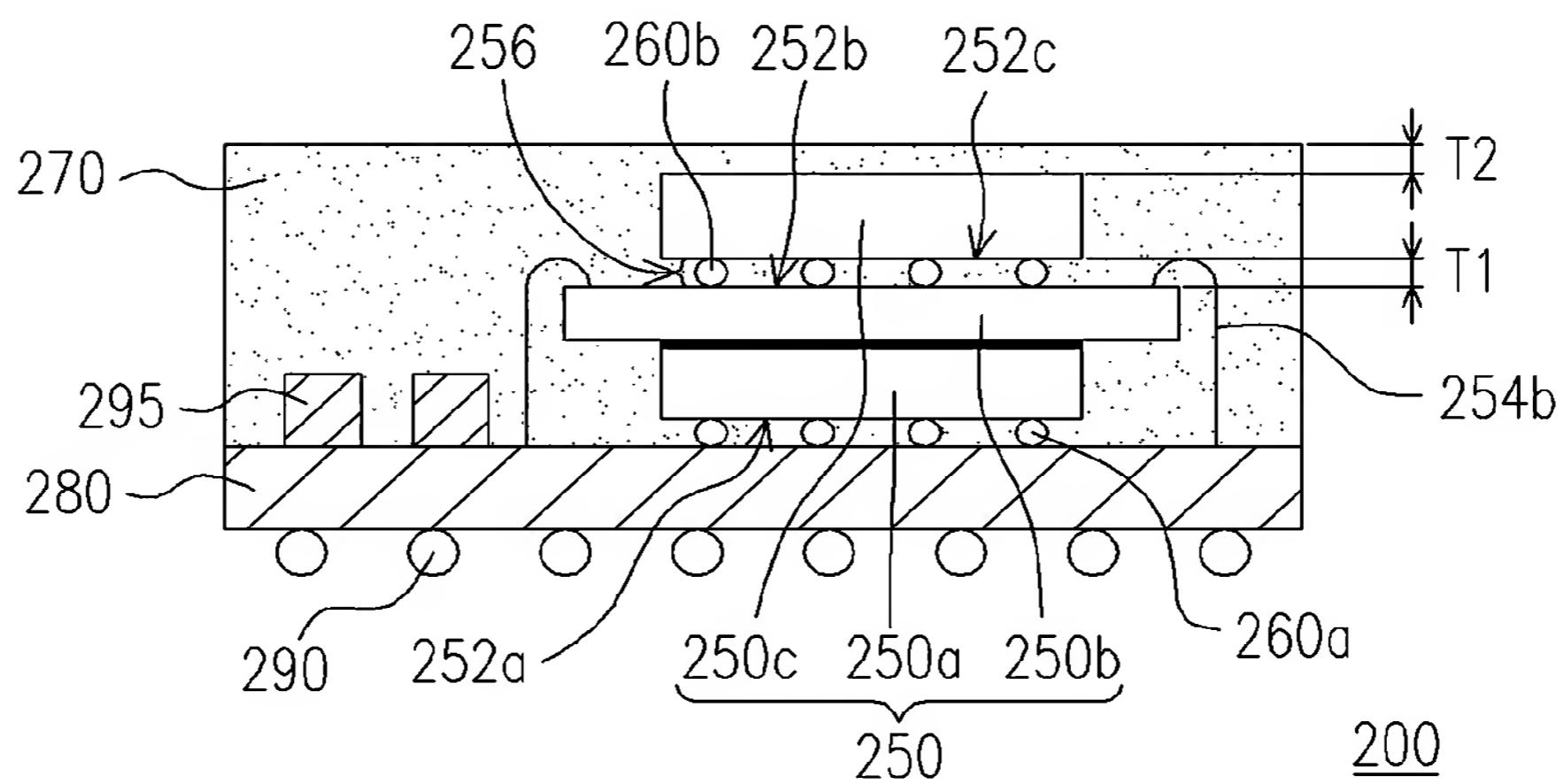


FIG. 5

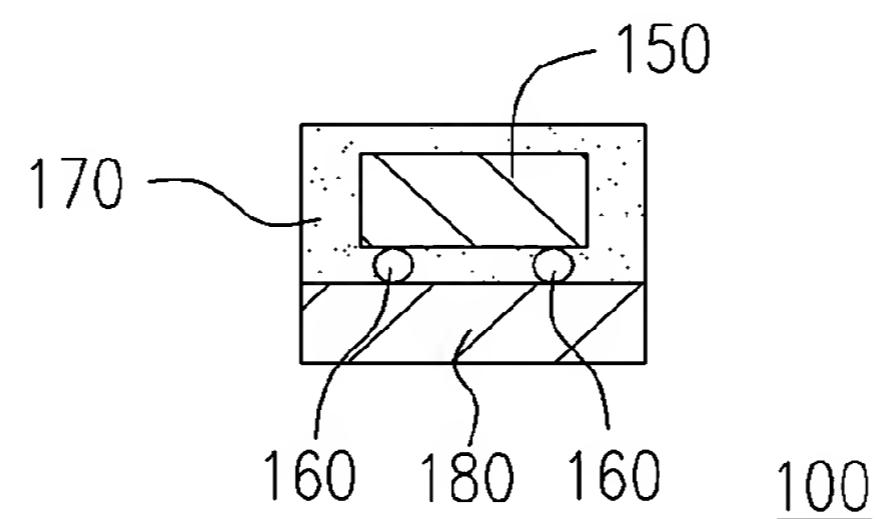
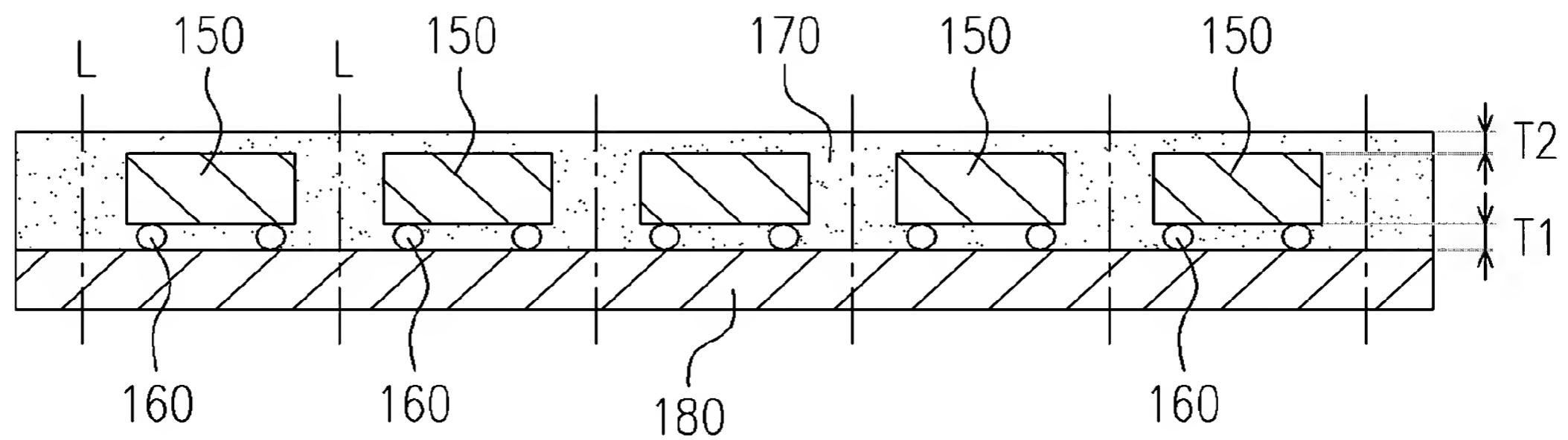


FIG. 6B

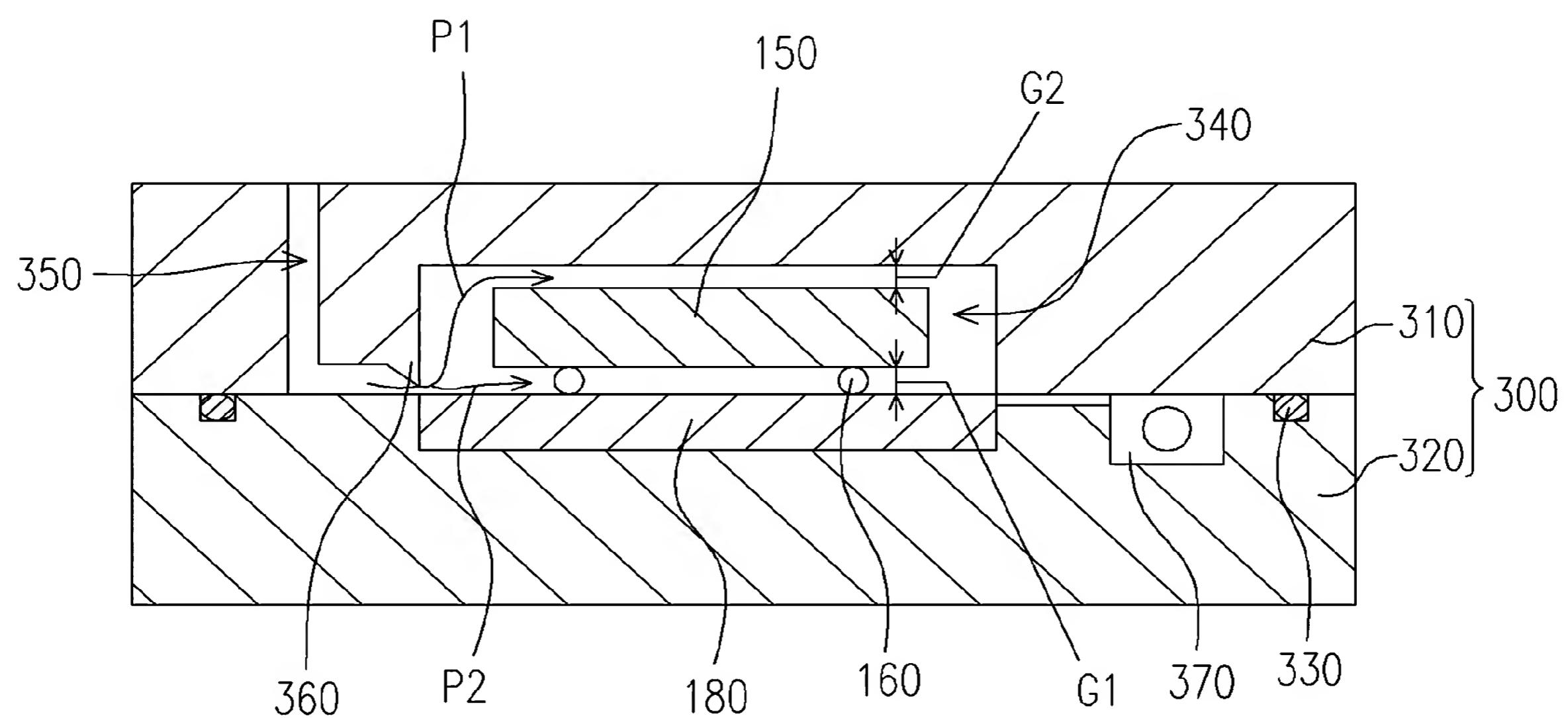


FIG. 7

	Examples 1, 6, 7 and contrast examples 1, 5	Contrast example 2	Example 2
Molding Temperature	170°C	170°C	170°C
Degree of Vacuum	1 mmHg	Atmospheric Pressure	15 mmHg
Encapsulating Material Category (Silica) *1	A	A	A

	Example 3	Example 4	Example 5	Contrast example 3	Contrast example 4
Molding Temperature	170°C	160°C	180°C	170°C	170°C
Degree of Vacuum	80 mmHg	1 mmHg	1 mmHg	1 mmHg	1 mmHg

Encapsulating Material Category (Silica) *1	A	A	A	B	C
*1 Encapsulating material A: average particle diameter 5 µm maximum particle diameter 21 µm					
Encapsulating material B: average particle diameter 13 µm maximum particle diameter 40 µm					
Encapsulating material C: average particle diameter 13 µm maximum particle diameter 74 µm					

FIG.8

	Example 1	Contrast example 1	Contrast example 2	Example 2	Example 3	Example 4
Over mold layer thickness (mm)	0.13	0.13	0.13	0.13	0.13	0.13
Index *2	1.8	1.8	1.8	1.8	1.8	1.8

	Example 5	Contrast example 3	Contrast example 4	Example 6	Contrast example 5	Contrast example 6	Example 7
Over mold layer thickness (mm)	0.13	0.13	0.13	0.05	0.03	0.28	0.12
Index *2	1.8	1.8	1.8	0.7	0.4	3.9	1.5

*2 over mold layer thickness/flip-chip bonding gap

FIG. 9

	Example 1	Contrast example 1	Contrast example 2	Example 2	Example 3	Example 4
Package thickness *3 (mm)	0.7	0.7	0.7	0.7	0.7	0.7
Flip-chip bonding gap filling capacity *4	100%	100%	15%	99%	97%	100%
Over mold layer filling capacity *5	100%	100%	40%	95%	90%	100%
Solder persistence *5	▲	O	X	O	O	▲
Temperature recycle reliability *6	2000 cycles	500 cycles	--	2000 cycles	2000 cycles	2000 cycles
Reliability *7	>500 hours	168 hours	--	>500 hours	>500 hour	>500 hours
Others						

	Example 5	Contrast example 3	Contrast example 4	Example 6	Contrast example 5	Contrast example 6	Example 7
Package thickness *3 (mm)	0.7	0.7	0.7	0.62	0.6	0.85	0.8
Flip-chip bonding gap filling capacity *4	100%	40%	30%	100%	100%	100%	97%
Over mold layer filling capacity *5	100%	70%	50%	100%	60%	100%	100%
Solder persistence *5	▲	X	X	▲	▲	▲	▲
Temperature recycle reliability *6	2000 cycles	--	--	2000 cycles	2000 cycles	2000 cycles	2000 cycles
Reliability *7	>500 hours	--	--	>500 hours	>500 hours	>500 hours	500 hours
Others	⑧						

*3 measured package substrate thickness + Mold seal thickness

*4 relative to chip area, material filling area ratio (filling capacity) average value over mold filling capacity visually inspected, detached from the substrate thereafter

material filling capacity of the flip-chip bonding gap also eye inspected

*5 solder persistence: ▲: JEDEC level II passed; O: JEDEC level III passed;

(n = 11) X: JEDEC level III failed

*6 temperature recycle reliability: gaseous surrounding, 65°C/15min ~ 150°C/15min

(n = 11)

*7 PCT reliability 121°C/2atms

⑧ assessed using a total of 32 molded devices, 2 defective devices/remaining non-defective devices

FIG. 10